

Program Abstracts

Pre-Conference Primers, Saturday, 2:00 p.m. – 5:00 p.m.

Predictive Modeling

Introduction to Predictive Modeling for Crime Mapping and Crime Analysis, Donald E. Brown. This presentation provides an introductory tutorial to predictive modeling for crime analysis, but with a perspective of its use within crime mapping. Predictive modeling can be roughly categorized into one of the following areas: time series, regression, state-space, simulation/gaming, and neural networks. The presentation will provide a brief overview of each of these areas so that participants will have an understanding of the basis for techniques in each area. For example, within the time series area, we will explore simple methods based on models of periodicity and trend and then discuss how these simple ideas can be enhanced. In each area, we will also examine issues relevant to the use of the techniques in conjunction with crime mapping and spatial analysis.

Chaotic Cellular Forecasting: Chaos Theory, Cellular Automata, and Artificial Neural Networks, Andreas M. Olligschlaeger. An increasing number of social science researchers are turning toward non-traditional techniques to model spatio-temporal phenomena. One such technique is Chaotic Cellular Forecasting (CCF). Rooted in chaos theory, CCF employs a three-dimensional cellular automata approach to forecasting and uses artificial neural networks for model estimation. This session outlines the development of CCF, as well as data requirements and implementation issues. The utility of CCF and a comparison to other modeling techniques is illustrated by presenting empirical results of leading indicator models used to forecast the spatio-temporal spread of crime.

Implementing GIS in a Law Enforcement Agency

Implementing GIS in a Law Enforcement Agency, Elizabeth R. Groff and Deborah Thomas. This course frames the issues involved in implementing GIS in a criminal justice organization. As such, it provides a basic understanding of both technical and organizational factors involved. Technical issues covered include how to conduct a GIS needs analysis, hardware, software, data, functionality, and integration with current systems. Organizational factors discussed include strategies for gaining acceptance of the technology, common obstacles encountered, and key issues surrounding system and data access. Persons who complete this course will have a broad understanding of the tasks and challenges involved in achieving a successful GIS implementation.

What is Crime Mapping? A GIS Primer

What is Crime Mapping? A GIS Primer, Kurt Smith and Julie Wartell. This workshop is designed for participants who want to learn the basics of crime mapping. No prior

knowledge is required, and explanations and activities will be very practical. By the end of the session, participants will be able to:

- ?? Explain the term “crime mapping”
- ?? Understand and apply the basic concepts and components of geographic information systems (GIS)
- ?? Discuss and realize the importance of the data process and data dissemination for GIS
- ?? Identify sources of geographic data and describe several different types of GIS analyses and their application to crime analysis and criminal justice
- ?? Understand how to use mapping in their agency to support patrol, investigations, administration, crime prevention, courts/corrections, and the community
- ?? Describe technological innovations on the horizon, using GIS

Getting Started with GIS: A Hands-On Workshop

Making MapInfo a Part of Your Operations, Noah Fritz and Steven Hick. The instructors for this session are Noah Fritz and Steven Hick, Directors of the Crime Mapping and Analysis Program (CMAP) and the Department of Geography—GIS Program at the University of Denver, respectively. They work collaboratively to bring practical hands-on training through interactive computer labs at the University’s Keck Geo-Sciences Building and the Crime Mapping Technology Center—a National Law Enforcement and Corrections Technology Center and an NIJ-sponsored program. Each has over 15 years experience in the fields of crime analysis and police systems, including geographic information systems.

Attendees will use their own laptop computers and will work through a number of interactive, hands-on exercises using MapInfo GIS software demonstrating a number of crime mapping techniques. The course will begin with a brief overview of the utility of crime mapping for crime analysis—specifically, pattern identification, resource allocation and problem solving. The second phase of the training will focus on a practical problem solving exercise. The hands-on problem will adhere to a deductive approach using the SARA problem oriented policing process. Participants will emulate data extraction/collection, quality control (data cleaning), base map creation, geocoding, point symbol mapping, density mapping, hotspot prioritization, and micro-level in-depth analysis, allowing the attendees to experience the process of “drilling down.” This workshop provides the insight and application for using the problem-solving approach to more fully understand the scope and nature of community problems. Map layouts and geo-correlated layers will be introduced at the end of this short introductory course.

ArcView Training Workshop Using CrimeMap Tutorial, Wilpen L. Gorr and Yvonne R. Thompson.

How the Class Will Work. Using their own laptop computers, attendees will work through the step-by-step *CrimeMapTutorial* with the help of the instructor and teaching assistant. The workshop room will have tables and chairs, power strips, and a projector for the instructor’s computer. The instructor will make periodic brief lectures, students will work at their own pace through tutorials, and the instructor and TA will help students on a one-on-one basis. Students will have homework problems to complete, if they desire, at work or home after the workshop. Students can take the printed *CrimeMapTutorial* and data CD back to their police departments for training users (just teach part 1) or for starting GIS builders (teach part 1 and part 2). The instructor will make suggestions on alternatives for additional training.

Content. The workshop has two parts: (1) using a crime mapping GIS, and (2) building a crime mapping GIS. Students will start in part 1 by using a completed version of the GIS that they will build in part 2. Included in part 1 will be learning the file structure and documentation of the system, and printing and querying crime maps. In part 2, students will address-match offense and CAD data; build pin and area maps; and combine pin and area maps to produce a “drill-down” map with a jurisdiction-wide (early warning) crime change map, down to pin map with detailed records (suspect, victim, etc.). While outside the scope of the workshop, the GIS built in part 2 can serve as a template for automating daily production of maps.

Related CMRC Conference Session on Crime Analysis. Phil Canter and Wil Gorr will offer a session entitled “Crime Analysis: From the Ground Up” at the Crime Mapping Conference that will discuss conceptual and practical issues in building a crime mapping system. This session will make a good follow-on to the workshop.

Technical Requirements for Attendee’s Laptop Computers:

- ?? Laptop Computer: Industry-standard personal computer with a Pentium Intel-based microprocessor and a hard disk
- ?? Operating System: Windows 95/98 and Windows NT 4.0, 2000
- ?? Memory: 24 MB RAM (32 MB recommended)
- ?? CD drive to load data for tutorial
- ?? 25 MB free disk space on the c:/drive to store data for the tutorial
- ?? ArcView GIS 3.2 installed on your computer (your own copy)

Opening Session, Sunday, 1:30 p.m. – 2:45 p.m.

Mapping to Aid Decisionmaking: The Chief’s Perspective

Risk Focused Policing: Mapping Risk Factors to Control Crime Before It Occurs, Jim Bueermann. In 1994, the Redlands Police Department simultaneously introduced Community-Oriented Policing and Problem Solving (COPPS) and GIS as a crime analysis tool to the citizens of Redlands. Since then, the department has merged both concepts within the theoretical framework of Risk and Protective-Focused Prevention (RPFP) to better facilitate an understanding of the causes and prevention of adolescent problem behavior such as substance abuse, delinquency, violence, dropping out of school, and teen pregnancy. The synthesis of COPPS and RPFP is called “Risk Focused Policing” and is defined as “a data and results-driven, community-oriented policing and problem solving strategy which focuses on those factors in a community which place its youth and their families most at-risk for criminal and other problem behaviors.”

This strategy has led to the mapping of community, family, school and peer group risk and protective factors at the neighborhood level, which enables the police department to serve as a catalyst for community transformation. In addition, it led to the merging of two city departments so that police, housing, recreation, and senior services are all in one department (Police) to better facilitate the strategies necessary to make substantive, preventative, and interventive changes in the community.

Taking It to the Street: Getting GIS Information to Officers and the Public, Tom Casady. The Lincoln, Nebraska, Police Department makes extensive use of crime and incident mapping in the context of community-based policing. Department personnel use mapping to

identify trends amenable to problem-oriented policing projects and to assess the results of these projects. Like many departments, Lincoln conducts regular internal staff meeting reviews of mapped crime trends. Rather than being used strictly as a means of holding commanders accountable, Lincoln's version, called ACUDAT, is aimed at informing field personnel—street sergeants, detectives, investigators, and officers—of the current trends occurring in their areas. Public distribution of mapping products is a significant part of the department's community policing strategy. The department makes use of the Internet to distribute interactive maps and data to the general public and neighborhood organizations, generating over 50,000 hits monthly on its web site.

Managing Police Services through Mapping, Joseph J. Santiago. The Newark Police Department uses mapping as a tool to manage police services. The most obvious use is for crime and the Comstat process, which we fully employ. Recently the departments embarked on new uses of mapping. These include emergency situations with multiple locations and officer integrity investigation through the Internal Affairs Division. The Director's presentation will discuss how we use mapping in these three areas and our future plans for mapping.

Concurrent Panels, Sunday, 3:14 p.m. - 4:45 p.m.

Base Maps: Building a Platform for Analysis (*Repeats on Monday at 8:30 a.m.*)

Identifying Practical Mapping Layers, Thomas A. Evans. The Enforcer Geographic Information System is an Enterprise data initiative designed to enhance cross-jurisdictional mapping capabilities. Project development has been based on Pinellas County's Geographic Information System, which currently contains hundreds of geographically referenced layers maintained by the departments that own the data. The criminal justice information integrated with the system comes from the Pinellas County Sheriff's Office, the Clearwater Police Department, Florida Department of Corrections, and several other local sources. Through this cooperative effort, we eliminate the false boundaries created by jurisdictions and gain vast utility through shared data, as well as access to the Pinellas County layers.

Base Maps, Data Sharing, and the National Spatial Data Infrastructure, Norm E. Gunderson. Federal Geographic Data Committee information systems that facilitate the display and analysis of geographic (spatial) information continue to increase in use and importance in decisionmaking at all levels of government and in private industry. The analyses, in turn, depend on the availability, quality, and compatibility of digital geographic data. Development of the data is normally the highest cost element in any effort to implement geographic information systems (GIS). An analysis conducted several years ago by the Federal Office of Management and Budget (OMB) revealed that the Federal government annually invests billions of dollars in the acquisition and production of geospatial data; many of these data collection activities are redundant; and considerable savings can be realized if the data can be more easily found by, and made more accessible to, the broader community of potential users.

In April 1994, President Clinton signed Executive Order 12906 establishing the National Spatial Data Infrastructure as the technology, policies, and people necessary to promote geospatial data sharing throughout all levels of government, the private and non-profit sectors, and academia. Since 1994, many organizations have joined together under the Federal

Geographic Data Committee to define the means and relationships through which data can be more easily shared.

This presentation will discuss two products released by Federal agencies that provide ready access to their data and the capability for their data to be integrated with other data from additional sources.

LandView III is a Windows-based desktop mapping program that was developed by a partnership of the Environmental Protection Agency, the National Oceanic and Atmospheric Administration, and the Bureau of the Census, with additional support from the U.S. Geological Survey. The Department of Housing and Urban Development (HUD) offers a tool called **Community 2020**, which is a fully functional GIS software product tailored for HUD data users to present important information about local neighborhoods and communities in easy to understand maps and engage in informed decisionmaking about community and economic development planning at the local level.

Both LandView III and Community 2020 provide substantial amounts of data. The products serve a variety of purposes, from entry level introduction to computer mapping, dissemination of large Federal data sets, and the capability to import other data to augment the data provided with the software. The two products have already provided the means for significant exchanges of data among a wide number of Federal agencies and have served as “starter kits” for other public organizations at all levels of government that are beginning to use geospatial data and analysis in their day-to-day activities.

The presentation will conclude with a discussion of the activities of the Federal Geographic Data Committee (chartered under OMB Circular A-16) to promote access to, and sharing of, the Federal government's extensive holdings of geospatial data.

Address Matching and Data Integrity Issues (*Repeats on Monday at 3:30 p.m.*)

Geocoding for Success, Christopher S. Gebhardt. In this session, users will learn various ways to improve their geocoding success rates, also known as “hits.” Different strategies will be examined including geofiles, geocoding, and dynamic address matching. Common techniques to improve the overall collection of address information will be discussed. Attendees will learn what other agencies are doing to achieve high success rates and how they can implement these policies in their own organizations. The importance of geocoding 100 percent of all records will be stressed with examples. The presentation will conclude with assorted problems the speaker has noticed and overcome, including vacant lots, fields, highways, and the use of GPS.

Mapping Research Applications I

When is a Hotspot a Hotspot? Spencer Chainey. Maps showing the distribution of crime as a digital continuous surface are increasingly replacing point (or pin) maps and thematic boundary maps as ways to visualize and understand spatial patterns of crime events. The creation of these continuous surface or “hotspot” maps allows for easier interpretations of point clusters or concentrations. Several techniques and algorithms are currently used for the generation of hotspot maps, all of which have different merits. These mainly relate to their ease of use, application to different types of events (i.e. personal or property crimes), visual results,

and interpretation. Few of these methods help to distinguish a consistent defining threshold that helps the analyst decide when a cluster of crimes can be defined as a hotspot; the visual definition of a hotspot from the resulting map is very much left to the “whims and fancies” of the map designer. This session will present results of some partnered research that explores different techniques for creating statistically robust hotspot maps. Our methods include the application of point pattern analysis techniques to identify spatial randomness, spatial clustering, spatial autocorrelation, and Local Indicators of Spatial Association (LISA statistics). We review the use of visualization tools to assist in formatting the design of the continuous surface map and the definition of all hotspots. We also review how temporal patterns of crime can be statistically tested and visualized.

Mapping Out Hazardous Spaces for Police Work, James L. LeBeau. This presentation discusses the application of GIS for assessing, delineating, describing, and analyzing areas or spaces that are hazardous for police officers.

Using the ArcView GIS system and its Spatial Analyst Extension, five different layers or floating point grids are created depicting the densities of emergency calls for service, calls pertaining to gun violence, incidents of police use of force, incidents of injuries to officers, and incidents of officers requesting immediate help. Using statistically significant threshold values, each layer is converted into an integer grid or layer. The five grids are added together to produce a map depicting the variation of hazardous spaces across the urban landscape.

The site for this research is the Charlotte-Mecklenburg County, North Carolina, Police Department.

Mapping Tools for Management and Accountability, Philip G. McGuire and Doug Williamson. A team of researchers from City University and staff from the New York City Police Department’s Office of Management Analysis and Planning have been working to develop second generation mapping tools and techniques that extend police managers’ command, control, and assessment capabilities. The work has been funded by the National Institute of Justice (NIJ) and has resulted in an advanced mapping analysis tool for use by the New York City Police Department’s CompStat Unit.

The advanced tool set includes smoothed density hot spot analysis (based on kernel smoothing), coverage analysis (based upon Voronoi polygons), block analysis (based upon census blocks) and animation capabilities, along the with ability to work with fixed facility overlay layers, including orthophotos, and user supplied highlighting.

The capabilities of the tool set will be discussed, along with likely future enhancements within the NYPD’s CompStat environment and department-wide crime analysis and mapping systems currently under development.

Introduction to Crime Analysis (*Repeats on Monday at 3:30 p.m.*)

Crime Analysis—From the Ground Up, Philip Canter and Wilpen L. Gorr. This is a session for crime analysts new to GIS and computerized analysis. The presenters will cover concepts and provide demonstrations on four topics:

- 1) Police data issues—attributes, related records, and data quality.
- 2) Geography of crime—base maps, crime patterns, and representations on maps.

- 3) Crime analysis data warehouse—GIS processing of police data; demographic, land use and other data; data aggregation.
- 4) Crime analysis applications—for uniformed officers, investigators, and managers.

Examples will be drawn from two NIJ projects: CrimeStat (free statistical package) and CrimeMap Tutorial (free step-by-step tutorials for ArcView and MapInfo).

Regional Applications: Mapping Across Boundaries

Regional Crime Analysis Program: Description and Applications, Donald E. Brown and Jason Dalton. This presentation will describe the Regional Crime Analysis Program (ReCAP). ReCAP is a crime analysis package consisting of statistical, reporting, and mapping tools. The system exploits criminal incident records contained in records management systems to support crime analysis functions. A major goal for ReCAP is to give law enforcement agencies the advanced tools they need to analyze large amounts of data without requiring a detailed knowledge of database management systems, statistics, or geographic information systems. The mapping functions of ReCAP include incident level plotting of crimes; the normal navigational tools of zooming, panning, selecting, etc.; symbology; and statistical clustering of incidents, using both a nearest neighbor algorithm and kernel density estimation for *hotspot* detection. To support mapping, ReCAP contains a geocoding report, where users may update incorrect address information or supply coordinates for geocoding. In addition to mapping, ReCAP contains functions for detecting significant changes in crime levels and for searching databases for similar incidents, modus operandi, or suspects. After providing an overview of ReCAP, this presentation will also discuss the use of ReCAP within two Virginia regions, Richmond and Charlottesville/Albemarle.

Regional Crime Analysis GIS (RCAGIS), John E. DeVoe. Working closely with several police departments in the Baltimore, Maryland, and Washington, D.C. areas and with Ned Levine, Ph.D., the U.S. Department of Justice, Criminal Division, Geographic Information Systems (GIS) staff has developed the Regional Crime Analysis GIS (RCAGIS), a powerful, MapObjects-based GIS application that targets the crime mapping, analysis, and automated reporting needs of police officers, crime analysts, and police department managers. RCAGIS includes tactical, strategic, and accountability tools.

This paper and presentation will discuss the infrastructure that is required, the duties and responsibilities of the major players, and hurdles that are present when coordinating and developing a regional crime analysis application. RCAGIS is currently being tested by police departments as version Beta 1.0. It was tested as Alpha Versions 1.0, 2.0, and 3.0. The programming code will be made freely available by December 31, 1999, via the Criminal Division's homepage: www.usdoj.gov/criminal/gis.

Police-University Partnerships Mapping Crime Across the Atlanta Region: The Greater Atlanta Data Center, Alisa R. Sposato and Edward Dempsey. The Greater Atlanta Data Center (GADC), within the Burruss Institute at Kennesaw State University, is a cooperative effort among police and universities in the Metro Atlanta region to establish a secure network and improve the use and dissemination of information relevant to public safety. The primary purpose of GADC is to provide law enforcement the technical assistance and support to implement a practical and flexible Geographic Information System (GIS). The customizable

system allows unprecedented data sharing and analysis of crime patterns across geographic and political boundaries by integrating information from police incident reports with geographic, demographic, and other relevant data.

GIS for Community Policing and Problem Solving

Constructing Dangerous Places: Using Hot Spot Analysis to Assess “Spatial Sensationalism” in Newspaper Coverage of Homicide, Derek J. Paulsen. While much research has been conducted concerning the coverage of crime by the media, little is known about the spatial aspect of this coverage. Specifically, media research has failed to determine whether the coverage of crime by the media is truly representative of where crime occurs, or whether media coverage presents crime as occurring disproportionately in certain areas of a city. Building on earlier research, and utilizing an exhaustive spatial data set and advanced spatial statistics, this research attempts to determine the degree to which newspaper coverage of homicide is spatially representative of the true homicide picture. Findings indicate that hot spots of media coverage of homicide incidents distort the spatial nature and frequency of actual homicide incidents. In addition to trends in the spatial coverage of homicides, important social implications relating to fear of crime will be discussed.

Mapping and Crime Analysis by Community Organizations, Thomas F. Rich. A recently completed National Institute of Justice-funded project examined how community crime prevention organizations in Hartford, Connecticut, used a mapping and crime analysis system to facilitate community-based problem solving and community policing. The presentation will examine the extent to which the different community organizations used the system, provide examples of system use, and summarize the effect of the system on community organization effectiveness, police-community relations, and perceptions of neighborhood safety.

Using Spatial Analysis in the SARA Model, Steve White. This presentation will expose attendees to a systematic approach to using GIS spatial analysis applications in daily tactical crime analysis. Following the framework of the SARA model, attendees will be shown how to use hot spot analysis to scan for and analyze crime trends, patterns, and series, as well as learn the effects of problem solving efforts on them.

Concurrent Panels, Monday, 8:30 a.m. - 10:00 a.m.

Base Maps: Building a Platform for Analysis (Repeated from Sunday at 3:15 p.m.)

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Theory: The Foundation of Mapping

Geographic Analysis of Illegal Drug Markets, George F. Rengert and Sanjoy Chakravorty. Past research has established two important geographic principles concerning the marketing of illegal drugs—that illegal drug markets tend to be spatially concentrated, and that the location and marketing characteristics of the market place will vary depending on whether customers are local or regional. The present research will build on these principles to determine

whether the location of illegal drug markets in Wilmington, Delaware, can be predicted using variables that measure the relative size of the local demand combined with variables that measure accessibility to regional customers. The data include arrest and call for service data from the Wilmington Police Department for the years 1990, 1991, and 1992, so as to be comparable to 1990 census data.

If You're Going to Have a War on Crime, You Need Good Maps, Terry Whin-Yates.

The integration and the application of criminological theories, Environmental Criminology and Crime Pattern Theory with geographical spatial analysis and Geographic Information Science (GIS) is critical. Spatial crime analysis research will attempt to identify the serial nature of crimes, the type of person who commits these crimes, their crime scene patterns, and the offender's motivation for committing such offenses, more specifically, the relationship between criminal activity and possible contributing factors.

This study examines Crime Pattern Theory and will use several examples: open illegal drug markets, an established street prostitution area, break-and-enter's, motor vehicle theft, and crime near rapid transit stations.

Mapping crime will assist police departments, other organizations involved in crime control, and criminal justice decisionmakers in their policy discussions. They will, in turn, use the data analyzed to depict crime patterns to allocate limited police resources. Police services are geographically based and the analysis of this information is integral to community-based policing. This research will assist police departments in visualizing and analyzing crime incidents.

Furthermore, careful predictive crime analysis should make it possible to reduce urban crime rates by better justice resource allocation and by informed decisions from urban planners.

Tracking Firearms for Prevention and Intervention

Eliminating Boundaries in Philadelphia to Identify Patterns in Firearm-Related Incidents, Katrina Baum. Philadelphia experiences an alarmingly high level of firearm-related injuries. As a result, the Philadelphia Police Department, ATF, and the University of Pennsylvania have been working collaboratively on a project to identify patterns of firearm-related incidents in the City of Philadelphia. Executing a trace for a firearm in Philadelphia is currently a paper-driven and labor-intensive process that involves pulling data from non-relational databases. This paper describes the process of streamlining this effort and migrating it to an intranet, browser-based platform to generate maps, charts, and reports. Attention is devoted to boundaries that exist within law enforcement and how these can be overcome.

Application of GIS Technology to Fighting Illicit Firearms Trafficking, John R. Freeman and Richard S. Young. In recent years, the Bureau of Alcohol, Tobacco and Firearms (ATF) has begun to apply GIS technology to the fight against illicit firearms trafficking and violent crime. One of the ATF's primary missions is to enforce Federal firearms laws and regulate the firearms industry. As part of this effort, the ATF traces hundreds of thousands of crime guns that are recovered each year by Federal, state, and local law enforcement agencies. In addition to developing investigative information for these agencies, ATF personnel comb the trace results in search of patterns of activity that may expose illicit firearms traffickers. The Crime Gun Analysis Branch routinely maps crime gun recovery locations in major cities for

local ATF offices. The Branch also maps source areas for guns recovered in selected cities. Although these functions have been centralized, ATF is working to deploy GIS tools and techniques to analysts in the local field offices.

Building Partnerships through Crime Mapping, Jennifer Gardner and Lex Bitner. Stemming from a spate of gun-related violence in the city of Springfield, Illinois, the “Guns in Springfield” report analyzes three years of gun related crime reports. Utilizing various techniques including spatial, “hot spot,” and trend analysis, a determination of when and where gun violence was occurring, assisted in the formation of tactical patrol response strategies. The report was made possible because of a partnership between the Illinois State Police and the Springfield Police Department (SPD). This partnership was formed for the purpose of introducing and training SPD analysts in the use of ArcView and other statistical techniques for analyzing crime and forming strategic patrol and investigative plans.

Innovative Mapping Applications

GPS Enhanced Spatial Analysis of Public Housing Crime Hotspots with Real Time Light Meter Coverage, John G. Hayes and Donald B. Ludlow. Historically, poor lighting in public housing communities has contributed to public housing becoming prime locations for drug market activity. This study analyzes the relationship between incident and arrest locations for drug-related crimes and GPS-referenced light meter readings in four District of Columbia public housing communities. Analysis suggests drug activity occurs along edges of well-lighted and poorly lighted areas. Assaults, on the other hand, seem to occur in better-lit areas. These conclusions are tempered by inadequate geocoding of incidents using street addresses and await better data resulting from increased use of GPS technology by police.

Enhanced GIS and Mapping Support to Counterdrug Operations, Melinda Higgins, Nick Faust, and Lt. Col. Billy Asbell. This work will cover GIS and mapping applications specific to marijuana eradication efforts as part of the National Guard Bureau - Counterdrug Directorate (NGB-CD) support mission to drug law enforcement (DLEA) in the U.S. These GIS technologies are being enhanced and integrated within the Counterdrug Geographical Regional Assessment Sensor System (CD-GRASS) directed by the Georgia Tech Research Institute.

These applications include 3D visualization techniques overlaying digital imagery on terrain surfaces to create a virtual mission planning environment. Marijuana spatial prediction models derived from historical point source data have also been overlaid within the 3D virtual GIS environment to allow for quick visualization of high intensity growth areas. The presentation will also include an overview of NGB-CD's GIS and mapping support to DLEAs (NGB-CD's Digital Mapping Initiative) and operational results from field tests.

Starlight at Seattle Police Department, Ronald S. Rasmussen. This presentation will focus on the preliminary results of the Seattle Police Department's use of the Starlight Visual Information Analysis System. The Crime Analysis Unit of the Seattle Police Department evaluated Starlight by using CAD, RMS, and GIS data, as well as text from police reports, follow-up reports, statements, and data from any other relevant data source that can be harvested and examined. Starlight holds great promise to vastly improve the analysis of crime by revealing

information about the nature, character, and extent of the relationships between people, places and things in space and time.

Mapping Around the World I

***Crime Clocks and Target Performance Maps*, Antony K. Cooper, Chris Gilfillan, Melinda Potgieter, Peter Schmitz, and Pierre du Plessis.** Traditionally, automated crime mapping and analysis is based on the pin-mapping of individual crime scenes. If geocoded street addresses are not readily available and one cannot pin-map all the data manually, one has to work with aggregated crime data. This presentation will describe two innovative and powerful techniques that can be applied to aggregated data, namely *crime clocks* and *target performance maps*.

The South African Police Service (SAPS) records over 80 percent of all crime reported in South Africa in near real time on its Crime Administration System (CAS). The smallest geographical unit used by SAPS is the CAS Block; and for each case, the relevant CAS Block number is recorded in CAS. Using the Blocks' centroids and/or boundaries, one can readily map the crime data using a geographical information system (GIS).

Crime clocks display the distribution of crime in time and space using scaled pie charts positioned on the centroids of the CAS Blocks, showing the relative crime rates for a selected period. Each segment of a pie chart represents a selected time-slot (e.g., a two- or three-hour period) or day of the week. The first and last segments in the day or week are then adjacent, ensuring that there is no artificial break at the end of the day or week.

Target performance maps show the police's progress in combating crime. For each priority crime, we have calculated realistic, achievable targets, based on the current crime trends. We have also calculated lower, *stretching* targets that, when achieved consistently, signal significant and sustained reductions in the levels of crime. Periodically, actual, normalized crime rates are compared against the targets, and the results are plotted on mosaic maps to produce *target performance maps*, with the CAS Blocks coloured to show if the crime rate is worse than the normal target, between the two targets, or better than the stretching target.

***Localizing a Crime Analysis GIS Software, SCAS, for Use in Japan*, Yutaka Harada and Takahito Shimada.** Spatial analyses of crime by means of GIS have attracted increasing attention in both research and practice in the field of criminology and criminal justice. SCAS (Spatial Crime Analysis System) is an open-source GIS application for crime analysis developed by the U.S. Department of Justice. In order to promote the use of GIS in criminological studies and police practices in Japan, we have developed a "Japanese version" of SCAS, with the permission of the U.S. Department of Justice. Our localized version of SCAS has the capability of performing address geocoding based on Japanese address formats, while preserving most of the friendly user-interfaces of the original SCAS.

Using the Japanese version of SCAS, we have mapped crime data against a large-scale digital map. The crime data consist of incidence records of Penal Code offenses known to the police, obtained from a prefectural police headquarters in charge of a large urban area. The digital map, "Digital Map 2,500," is published by the Geographical Survey Institute of Japan and has the precision of 1:2,500 level. By now, we have confirmed that basic functions of our localized version of SCAS, such as searching crime data by their attributes and drawing grid-surfaces of incidence density, work correctly with reasonably good speed.

Our presentation discusses such issues as (1) features of our localized version of SCAS, (2) technical challenges and solutions in the process of localization, (3) examples of practical applications in Japan, and (4) the value of DOJ's open-source policies, which may contribute to expanded boundaries of GIS applications toward cross-national comparative studies on crime.

View from the Metropolis: Boundary Realignment in London, England, and Its Impact on Data Sharing Partnerships, Mark Patrick. The establishment of a strategic authority for London in April 2000 has prompted the Metropolitan Police Service in London to realign its geographic boundaries to match those of local government. As well as presenting the Service with considerable change management issues, realignment is offering tangible benefits in the area of data sharing partnerships. This presentation will focus on how some of the geographic and technical changes that are taking place within the Metropolitan Police are helping the Service meet one of its objectives, to reduce drug-related crime in partnership with other agencies. The presentation considers the use of these new data sets within a GIS environment and mentions the development of a corporate hotspot methodology for police divisions in London.

Community Beat Book Showcase

Experience of the Redlands Police Department with the Community Policing Beat Book, Christopher R. Catren. The advent of Community Oriented Policing and Problem Solving in the Redlands Police Department brought with it many challenges. One challenge faced by the Community Policing Officers (C.P.O.'s) was the lack of a means by which the myriad of information required to address long-term problems could be collected, stored, and made readily available. Another challenge faced by the C.P.O.'s was the lack of readily available graphical information on crime, known offenders, and community resources. The introduction of the Community Policing Beat Book took great strides in addressing these challenges. While the Beat Book application has its limitations, it is a formidable resource that can be made available to C.P.O.'s in our department. This presentation will focus on the issues raised while preparing to use the Beat Book, the positive and negative aspects/uses of the Beat Book, and the functional needs that will greatly increase the usefulness of the Beat Book.

Community Policing Beat Book Application: An Overview, Liz Freeman. This session will provide an overview of the Community Policing Beat Book application and its functionality. The Beat Book is an easy-to-use application, created using ESRI's MapObjects, that gives an officer access to electronic maps that display information about the community such as land use, businesses, demographics, and landmarks. It also allows the officer to record and map their own information, such as contact information, locations of interest, and points of interest.

CPBB—Mapping to Fight a Drug Market, Kurt Smith. The Community Policing Beat Book allows us to build a shared perspective around all the law enforcement and community efforts to combat a persistent drug market in San Diego. In spite of varied efforts of different patrol squads and narcotics teams, a particular block has survived as a drug haven in spite of successful strategies in the surrounding area. Officers began working across squads, using airphotos and maps to facilitate analysis and organize efforts. With a deeper understanding, officers began gaining support from property owners and residents. Armed with the Beat Book,

information from specific enforcement locations to tax assessor's files can be stored, viewed, and analyzed conveniently. This overcomes what has allowed the market to persist: communication barriers within patrol and with the community. The Beat Book is bringing new life to the effort and allows us to coordinate our efforts with the community in a way that supports a real change in the area.

General Session, Monday, 10:30 a.m. – 12:00 p.m.

Crime Mapping: From Theory to Practice

***Environmental Criminology: Does Theory Matter?* Patricia L. Brantingham.** Crime mapping provides tools for visually presenting crime patterns. Crime mapping is evolving quickly. Stepping back to look at the reasons behind the crime patterns seen on maps can enhance this rapid development. This session presents some fundamental theories in environmental criminology that make it possible to understand better the spatial and temporal patterning of crime. There are daily routines that facilitate crime, places that generate and attract crime, and sites and situations that trigger criminal events. Using these theories makes it possible to “expand the boundaries” of crime mapping. This session presents the basic theories in environmental criminology (pattern theory, routine activities, and rational choice theory) with examples of how knowing these theories can aid the rapidly developing crime mapping field.

***Environmental Criminology: Criminal Investigative Praxis*, D. Kim Rossmo.** Perspectives from the geography of crime and environmental criminology—crime pattern, routine activity, and rational choice theories—provide a framework from which practical approaches to police problems can be developed. Geographic profiling, an investigative methodology that analyzes crimes locations to determine the most probable area of offender residence, is one example of practice guided by theory. Case examples (the Manhattan Upper East Side Rapist, the Lafayette South Side Rapist, and the Kelowna child murder) illustrate how the relevant principles of target backcloth, environmental cues, and mental maps can be used to help decode crime patterns.

Concurrent Panels, Monday, 1:30 p.m. – 3:00 p.m.

Communicating with Maps: Crime Mapping Principle and Practice (*Repeats on Tuesday at 8:30 a.m.*)

***Mapping Crime: Principle and Practice*, Keith Harries.** Although many law enforcement agencies employ maps as analytical and investigative tools, the great majority have not yet adopted mapping technology. This workshop serves as an introduction to crime mapping through the medium of a new book, *Mapping Crime: Principle and Practice*, to be made available to conference participants. Several topics will be addressed: the historical development of crime mapping, types of maps, maps for specific audiences, crime mapping and geographic information systems (GIS), applications of crime mapping, and some future directions. Numerous examples, generously provided by practitioners and researchers, will be used to illustrate the topics presented.

Mapping for Managers

Crime Mapping for Managers, Jeff Dean. This presentation will discuss the various components of crime mapping and how they can be used in crime analysis. Managers will get an overview that will help them learn to interpret different types of maps. Maps relating to tactics, strategies, and management accountability will be presented. These maps relate to patrol and investigations, crime prevention, community activity, and courts and corrections. Additionally, managers will learn about issues involved in facilitating GIS implementation. Other topics include issues surrounding the sharing of information with the public.

GIS—Mapping for Managers, Richard C. Lumb. This session is designed to assist police in understanding the potential of GIS for management and how to work with analysts to effectively develop maps and reports needed for decisionmaking and presentations.

Crime Mapping Surveys

Use of Computerized Crime Mapping by Law Enforcement: Final Results of the Crime Mapping Survey, Cynthia A. Mamalian. Computerized crime mapping has been demonstrated to be a powerful tool in the measurement and identification of crime patterns and in the support of crime control and prevention operations. This presentation will summarize the final results of the National Institute of Justice, Crime Mapping Research Center's *Crime Mapping Survey*, which provides national baseline measures on the use of computerized crime mapping in law enforcement agencies. The survey was designed to collect data on who uses crime mapping; types of mapping analyses; geographic files, hardware, and software used; agency coordination and administration issues; training and technical assistance needs; and the usefulness of and obstacles to effective crime mapping. The survey sample, methods, results, and policy and practice implications will be discussed.

Terrorists, Patrons, and Champions: Implementing Crime Mapping Systems Across the UK, Jerry H. Ratcliffe. The results of a survey of all police forces in the UK earlier this year show that mapping systems at the local area command level are available to less than 50 percent of analysts. The implementation of crime mapping systems in the United Kingdom has been a haphazard affair, with many police forces plagued with technical difficulties, data access issues, and internal political problems. The influences of disruptive individuals, senior management, and the individual user attempting to implement the system can be vital in determining the success of the project. This paper outlines the survey results and examines the findings.

Historic Context of the Uses of Crime Mapping, Mark A. Stallo. As far back as the Middle Ages, people have tried to establish relationships between events by visualizing them on a map. Computerized crime mapping developed slowly because of the expense and difficulty involved in conducting this type of analysis. However, with the development of more sophisticated computers and the unveiling of the U.S. Census TIGER files, it has become possible for vast numbers of individuals to develop crime mapping. This presentation will take the audience through the development period of computerized crime mapping to the explosion of

technologies that are being introduced today. The presentation will cover how other technologies such as the Internet changed the way crime mapping is conducted.

Mapping Research Applications II

Historical Homicide Hot Spots, Terri Marie Adams-Fuller. High rates of homicide have been a major issue of concern for the latter half of this century. Although homicide occurs in various regions around the country, many incidents of homicide occur in inner cities. Within some inner cities, concentrated levels of homicide rates exist in pockets of the city.

The clustering of homicide incidents in pockets of many cities leads one to question if place matters in relation to concentrated levels of homicide. Using Geographic Information Systems (GIS) technology, this study conducts a spatial analysis of homicide hot spots in three southern cities (District of Columbia, New Orleans, and Richmond) for the years 1989-1998. An analysis at the block-group level is being conducted on areas where hot spots have been identified, examining social, economic, and built environment conditions.

Spatial Modeling of Illicit Drug Markets: A Bayesian Perspective, Carlos Carcach and Damian Voltz. This paper discusses a Bayesian approach to the spatio-temporal modeling of illegal drug markets in Queensland, Australia. Size of local drug markets is estimated from monthly data on recorded drug crime in postal areas within police regions during the 1994-1998 period. Socioeconomic characteristics, together with data on police activity, are used to develop a hierarchical model that takes account of the spatial and temporal nature of the data. Estimates from the model are used to assess behavior of illegal drug markets and to develop dynamic maps for operational and strategic planning by police.

CrimeStat: A Spatial Statistics Program for the Analysis of Crime Incident Locations, Ned Levine. This session will demonstrate the *CrimeStat* spatial statistics program developed for the Crime Mapping Research Center of the National Institute of Justice. This is a stand-alone Windows program that interfaces with most desktop GIS packages, including ArcView, MapInfo, Atlas*GIS, Surfer for Windows, and ArcView Spatial Analyst. It is available from the Crime Mapping Research Center web page (www.ojp.usdoj.gov/cmrc).

Technical Studio I

Crime Scene Investigation System (CSIS), James O. Brumfield, William R. Gardner, Jr., and Randy A. Melton. An integrated station architecture with global positioning system (GPS), a laser-measuring device, digital camera, azimuth and elevation encoding units, and “ruggedized” field computer and printer with software, is demonstrated as a Crime Scene Investigation System (CSIS). CSIS is based on existing geographic information system software. The difference is, no one to date appears to have developed for the field, a spatial data gathering unit specifically for rural and urban crime scenes. CSIS is designed to streamline crime scene processing. CSIS geographically references and documents crime scene evidence, while producing near real time, highly accurate mapping. Items within the scene can be measured to the decimeter. The scene geo-positioning is sub-meter accurate.

RCAGIS: An Open Source MapObjects-Based Regional Crime Analysis Application, Jeffrey Burka. Criminals are typically not constrained by the jurisdictional boundaries that limit police departments. The Regional Crime Analysis Geographic Information System (RCAGIS) is a MapObjects 2-based package intended to help crime analysts, police officers, and administrative officials protect the public within their own jurisdictions, while also offering the ability to find and analyze data that cross jurisdictional boundaries. Developed as the third stage of a pilot project examining the use of GIS for crime analysis in police departments, the software, with source code, is expected to be available from the U.S. Department of Justice website by the end of 1999.

RCAGIS is designed to be flexible and includes extensive administrative tools that allow a consortium of police departments to specify standards for the way the system will operate in its member organizations, while still allowing those members some latitude in the functionality of the package. This presentation will focus on the use of MapObjects 2 along with Visual Basic, Crystal Reports, ODBC-driven back-end databases, and a spatial statistics package to develop a customizable application.

CrimeView Internet Map Server, Lewis O. Reed. The Anchorage Police Department is implementing an intranet-mapping application based on the Omega Group's "Crime View Internet Map Server" extension to ESRI's "Internet Map Server." The system's purpose is to provide a broad spectrum of data to the department quickly. The concept relies on the human ability to rapidly absorb and evaluate large amounts of visual data. The system will make crime mapping data available to every officer in the department 24-hours-a-day, seven-days-a-week. The goal is to give patrol, investigators, and command the information they need, when they need it.

Crime Series Analysis

Modeling the Crime Location Choice of Serial Offenders, David Canter and Brent Snook. The effectiveness of Geographical Profiling Systems (GPS) have not been defined precisely or measured empirically. Instead, illustrations have been presented of the situations in which they have provided apparently useful results. As a consequence, the discussion of these systems continues to obscure the ecological fallacy that is built into them. Such systems are based on gravitational and related models applied to decay functions of offender movement. The ecological fallacy that the general decay function characterizes all offenders is therefore at the heart of GPS applications. In order to evaluate the impact of varying models on the effectiveness of a specific GPS known as Dragnet, the effectiveness of a profiling system was defined as its "search cost." This is taken to be the relationship between the proportion of a target area searched and the proportion of a specified sub-sample of offenders located. As such, it is a development of Canter and Gregory's 1990 commuter/marauder model of criminal locational behavior. Calculating the search costs for a number of different decay functions applied to different samples, using Dragnet, reveals some important variations in the effectiveness of the system depending upon population and geographical characteristics. This is shown to be a function of differences in the geographical behavior between sub-groups of serial offenders. The results open up new possibilities for the modeling of that behavior. They also provide new perspectives on the impact of the ecological fallacy on the effectiveness of GPS.

Dynamic Spatio-Temporal Analysis: A Practical Demonstration of Crime-Series Interception, Dan Helms. Dynamic Spatio-Temporal Analysis (DSTA) is a technique for examining the sequential spatial and temporal relationships between disparate cases in a crime series with a view toward intercepting and eliminating the series. DSTA utilizes Geographic Information Systems (GIS), crime analysis software packages, statistical processing software, and database manipulation software to project a series forward in time and space, and also to track it backward to isolate its beginnings. It can be used to help identify likely suspects, likely victims, and probable times and places for the next event in a crime series.

Crime Mapping for Investigative Purposes: Can You Catch a Ted Bundy With Your Data? Robert D. Keppel. The main feature of this crime mapping presentation is to demonstrate the varied uses of crime mapping to apprehend criminals. The analysis of police and public records by plotting geo-coded locations from those records has aided in the investigation of many crimes. The visual display of a suspect's availability within crime-ridden locations has long been a method utilized by police investigators. This presentation emphasizes the data collection and geo-coding of that data so it can be used in computer mapping programs. The use of crime mapping for investigative purposes assists investigators in prioritizing and re-directing their investigations to apprehend perpetrators more quickly through different applications in crime mapping.

Specifically, the presentation will focus on best solutions in crime mapping applications for rape, hit and run, and murder investigations. It will highlight the various methods and data sources used to link criminals to a particular crime. This presentation is so visual and comprehensive that the maps come to life. Also, the presentation will emphasize the need for cross-jurisdictional mapping efforts, because criminals know no boundaries. An objective of this presentation is to inform attendees that after the crime characteristics (modus operandi) are recorded and given the highest priority, then that data will be used with the geo-coded locations and displayed graphically on a map that will enhance the apprehension of those types of offenders.

Concurrent Panels, Monday, 3:30 p.m. – 5:00 p.m.

Address Matching and Data Integrity Issues (*Repeated from Sunday at 3:15 p.m.*)

Geocoding for Success, Christopher S. Gebhardt. In this session, users will learn various ways to improve their geocoding success rates, also known as "hits". Different strategies will be examined including geofiles, geocoding, and dynamic address matching. Common techniques to improve the overall collection of address information will be discussed. Attendees will learn what other agencies are doing to achieve high success rates and how they can implement these policies in their own organizations. The importance of geocoding 100 percent of all records will be stressed with examples. The presentation will conclude with assorted problems the speaker has noticed and overcome, including vacant lots, fields, highways, and the use of GPS.

Mapping on the Web (*Repeats on Tuesday at 10:30 a.m.*)

Developing a Web-based Crime Mapping System, Deena M. Bowman-Jamieson. The San Diego Police Department (SDPD) has provided crime statistics and static maps for public access via the Web for over three years. With the department's commitment to community oriented policing and the rapid change in technology, SDPD in conjunction with the Automated Regional Justice Information System (ARJIS) has developed a regional Internet based mapping application making near real time crime data available to the public. In addition to a project overview, this presentation will address development and evaluation issues.

Lessons Learned: The Potential for Liability, Misuse, and Misinterpretation of Mapped Crime Data on the Web, Maria MacGunigal. In the spring of 1998, the City of Sacramento began a web development project to deliver, among other data, geocoded crimes for several crime categories. When we originally conceived of this project, we had no idea that the City of Sacramento would become one of the first sites in the nation to publish interactive crime mapping on the web. Early on in the development process, we realized the importance of protecting the disclosure of victim information and guarding against the misinterpretation of data by the users. The potential for liability, misuse, and misinterpretation of publishing crime data to the web is of particular concern, due to the ease of access and anonymity that the technology affords the users. It was, however, difficult setting policy guidelines and protecting the city's liability with so few agencies involved in publishing geocoded crime data to the web and very little discussion of the issues.

Introduction to Crime Analysis (*Repeated from Sunday at 3:15 p.m.*)

Crime Analysis—From the Ground Up, Philip Canter and Wilpen L. Gorr. This is a session for crime analysts new to GIS and computerized analysis. The presenters will cover concepts and provide demonstrations on four topics:

- 1) Police data issues—attributes, related records, and data quality.
- 2) Geography of crime—base maps, crime patterns, and representations on maps.
- 3) Crime analysis data warehouse—GIS processing of police data; demographic, land use and other data; data aggregation.
- 4) Crime analysis applications—for uniformed officers, investigators, and managers.

Examples will be drawn from two NIJ projects: CrimeStat (free statistical package) and CrimeMapTutorial (free step-by-step tutorials for ArcView and MapInfo).

Rural Crime Mapping Applications

Modified Global Positioning System, Remote Sensing, and Geographic System Technologies for Rural Crime Scene Geo-registration and Modeling, James O. Brumfield, William R. Gardner, Jr., Dewey D. Sanderson, Randy A. Melton, Michael J. Kane, and Terry W. Fenger. A Crime Scene Investigation System (CSIS) has been implemented in the geo-registration of multiple crime scenes in rural West Virginia. In a hallmark case, this system surpassed designed expectations. CSIS demonstrated a high level of accuracy in evidence positioning and a significant reduction in field time at the crime scene. In spite of extreme weather, including fog, freezing rain, and snow, CSIS performed consistently. The operator was

able to map approximately two hectares of rugged mountainous terrain. This area encompassed a shallow clandestine grave and numerous widely dispersed items of evidence. Four hundred features were mapped in under two hours. The scene map was produced, reviewed, and verified on site prior to investigative team departure.

Coupling Spatial Statistics and GIS to Uncover Spatial and Temporal Trends in Index Crimes in the Appalachian Region, 1977-1992, James G. Cameron and Stephen A.

Matthews. This presentation focuses on the application of GIS technologies and spatial statistics to the study of aggregate crime patterns within Appalachia. Specifically, we attempt to explain the spatial and temporal variation in Index crimes using data collected at the county level. The county level data comes from a variety of sources (Uniform Crime Reports, Census, Area Resource File, USDA, etc.), allowing for the incorporation of many independent contextual variables theoretically relevant to studies of crime. Moreover, the spatial patterning and linkage structures between all counties in Appalachia are embedded within our geographical database, allowing us to calibrate spatial regression models using SpaceStat and ArcView. Thus, in this presentation, GIS is used for both exploratory spatial data analysis and, through software coupling, confirmatory spatial data analysis ("spatial" regression models). Importantly, our focus on Appalachia allows us to investigate questions associated with rural crime, an under-researched area within criminology and crime mapping.

The paper concludes by stressing the importance of incorporating spatial structure in models in particular, and for stretching the GIS technology and revising the methodologies we currently use in crime analysis in general. The methodologies applied to county-level data are directly applicable to other ecological (area-based) studies of crime.

Technical Studio II

STAC, Carolyn Rebecca Block and Richard Block. Spatial and Temporal Analysis of Crime (STAC) has been used by police departments around the world to efficiently identify and display hot spot areas of crime. This technical studio provides (1) knowledge on how to get started using STAC with a variety of GIS software, (2) an examination of the capabilities of the spatial modules of STAC, and (3) a guide to interpreting the results of STAC analysis. This studio is a must if you need to utilize STAC quickly and efficiently.

Interactive Crime Mapping for the City of Overland Park, Kansas, Robert W. Meier. This crime incident mapping application is an ArcView 3.1 extension that is automatically loaded when ArcView is started. It is usually used inside another ArcView project, the Land Information System (LIS). The crime incident mapping dialog allows the user to select crime types from a predefined list, specify a number of days back from the current date or a date range, and specify a police shift. The selection is made directly from the Crime Analysis Unit database. The newly created theme is added to the current view and rendered using a standard set of crime symbols.

Mapping for Corrections

Introducing GIS into a Court in the use of a Classification System, Steve Ballance. This session is designed to address issues for the beginning user in GIS and risk classification

systems. The discussion will focus on the utilization of a risk classification system to determine program development through GIS. Attendees will be taken from the selection of a GIS software to the practical application of this technology in the criminal and juvenile justice systems.

Managing Detention Resources at the Federal Level, Jeff Cotter. With a prisoner population of over 32,000 pre-trial detainees, over 1,500 contract jail facility locations, 300 federal court locations, and 94 judicial districts nationwide, the U.S. Marshals Service (USMS) is constantly challenged with coordinating field personnel and managing the housing and movement of prisoners. This presentation will demonstrate how GIS technology is being used to assist the USMS with their day-to-day management and long-term planning of detention resources.

Utilizing GIS to Manage Correctional Facilities, Kenneth C. Hughes, Jr. JPSO is implementing a jail management application that includes a full graphical interface. Facility based data is integrated with inmate records and schedules to provide immediate visual assessments of conditions and planned events in the correctional facility. The graphic interface is structured through a geographic information system (GIS) so it offers a full menu of data management, reporting, and mapping capabilities. It is a powerful and effective tool for the management of inmates, their schedules, and the physical aspects of the correctional facility. JPSO has deployed the best data management and mapping technology available in this innovative jail management application.

Concurrent Panels, Tuesday, 8:30 a.m. – 10:00 a.m.

Communicating with Maps: Crime Mapping Principle and Practice (*Repeated from Monday at 1:30 p.m.*)

Mapping Crime: Principle and Practice, Keith Harries. Although many law enforcement agencies employ maps as analytical and investigative tools, the great majority has not yet adopted mapping technology. This workshop serves as an introduction to crime mapping through the medium of a new book, *Mapping Crime: Principle and Practice*, to be made available to conference participants. Several topics will be addressed: the historical development of crime mapping, types of maps, maps for specific audiences, crime mapping and geographic information systems (GIS), applications of crime mapping, and some future directions. Numerous examples, generously provided by practitioners and researchers, will be used to illustrate the topics presented.

Crime Mapping Case Studies: Successes in the Field

Repeat Address Mapping: Evaluating the Success of a Crackdown, Jeffrey S. Gersh. Researchers and analysts at the Washington/Baltimore High Intensity Drug Trafficking Area (W/B HIDTA) have developed a technique termed Repeat Address Mapping (RAM). This method is used to identify high crime places and to evaluate the effectiveness of law enforcement operations. RAM involves identifying and mapping the locations with the most repeat events. Since these locations account for a large proportion of crime, the mapping of only these locations make spatial patterns easier to identify. This method proved essential in evaluating a 1996 drug

enforcement operation in Langley Park, Maryland. In using a conventional method of mapping, major reductions in crime and drug activity were not readily evident when all data points were plotted. However, when RAM was used to set a threshold for mapping (referred to as minimum plotting density, or MPD), it became evident that the operation had a serious impact in reducing the amount of activity in the most problematic areas.

Sex Offender Enforcement: Success in the Field, Michelle Jaska. The Crime Analysis Unit provided the City of Rancho Cucamonga with target maps and information packets for a sex offender sweep they were going to conduct. The goal of the sweep was to gain compliance with those individuals who were required to register with their local law enforcement agency as a sex registrant pursuant to section 290 of the California Penal Code. There were 36 mapped target locations that were thought to be out of compliance prior to the sweep. The sweep was considered a success based on the following results: 25 warrants were issued; 6 came in to register; 3 arrests were made for non-compliance; and 2 targets were in compliance.

Cracking Down on Gangs with GIS, Kenneth W. Maly and Aaron C. Otto. One of the many tools used by Akron's Gang Unit is computerized mapping. Maps and other information from Akron's Gang Unit assisted prosecutors in making the first conviction with Ohio's new gang statute, "Participating in a Criminal Gang." A map of a gang's activity space is constructed using locations of graffiti markings; gang members' place of residence, work, and school; and all documented contacts by police. These tools are helpful in identifying and tracking gangs along with linking them to crimes they commit in this space. Presenters will cover how GIS is being used in the Akron Police Department and future plans for a gang tracking system.

Integrating Non-Crime Data

GIS and the Strategic Approaches to Community Safety Initiative in Winston-Salem, Julia B. Conley. Winston-Salem, North Carolina, is one of five communities participating in the Department of Justice (DOJ) sponsored Strategic Approaches to Community Safety Initiative (SACSI). The Winston-Salem Initiative has relied on DOJ, local agencies, and researchers to provide and integrate diverse community data sources for the implementation of research-based strategies to reduce and prevent juvenile violence. GIS coverages and applications have been developed to support this integrated method. Some of our challenges related to the application and database development have included identification, acquisition, integration, and standardization of data from multiple agencies; maintenance of confidentiality and security; and geocoding.

Where Do Hotspots Come From? Predictive Crime Mapping Using Tipping Point Theory and the Ecology of Crime, Gregory Saville and Charles Genre. Crime mapping data typically shows patterns that are descriptive and past tense—this is the tip of the iceberg. This session will discuss some of the limitations of these data. It will suggest alternative types of data and different ways in which crime mapping can be used. We will present data from an exploratory study conducted with the Tallahassee Police Department. The study begins to develop a whole new approach that uses tipping point theory to predict where hotspots will arise

future tense—these are crime patterns that are below the surface and can be of greatest use to justice, police, and planning policy-makers.

Beyond Pin Mapping: Advanced Analysis Workshop

***Spatial Analysis of Crime Patterns Using an Integrated GIS-Spatial Statistics Software Environment*, James G. Cameron and Steven Reader.** A traditional weakness of GIS software has been its lack of statistical functionality. In order to undertake analyses that go beyond crime mapping and basic spatial analysis, crime analysts (and indeed others) must often resort to exporting their “GIS database” to specialized statistical software such as SPSS, SAS, and S-Plus. This is particularly the case when such analyses go beyond crime data and are performed in combination with other community-level data, which may often be held in non-GIS type databases, spreadsheets, or statistical databases. Naturally, within the statistical software environment, the ability to link data to spatial location and “visualize” both raw data and results is lost.

To overcome the limitations of GIS with respect to statistical functionality, an emerging trend is the close integration of GIS software with established statistical software. Statistical software can then benefit from the graphical presentation of spatial data, and GIS software can take advantage of the comprehensive range of statistical procedures available in established statistical software products. Not surprisingly, one particular specialized field of statistical analysis, *spatial statistics*, is set to benefit tremendously from these developments.

Spatial statistics is essentially concerned with three types of analyses corresponding to three types of spatial data: point pattern data, geostatistical data, and area-based data. All three of these types of analyses have relevance for crime mapping applications and for extending the use of crime data into more general “community” analyses. The analysis of point pattern data involves such aspects as the detection of clusters at different spatial scales, evaluating the independence or otherwise of different point patterns from each other, and evaluating the presence of significant space-time trends. The analysis of geostatistical data is primarily involved with spatial data interpolation and the generation of “surface or continuous views” (contour plots) based on point observations. Finally, the analysis of area-based data is typically involved with spatial regression where the observational units are some type of area (census tracts, zip codes). In spatial regression, an important analysis step to consider is detecting and mapping the existence of spatial autocorrelation and assessing/mitigating its impact on the regression results.

The purpose of this workshop is to present a “how to” demonstration of how some of these spatial statistical techniques can be used within an integrated GIS-spatial statistical environment in such a way that map visualization of data and results is emphasized. The particular software environment featured combines the desktop GIS software, ArcView, with the statistical software, S-Plus, utilizing a recently released “S-Plus for ArcView” extension. The workshop also makes use of a specialized set of S-Plus functions for spatial statistical analysis contained in the S+SpatialStats module, as well as some custom S-Plus functions for spatial point pattern analysis (SPLANCS) which enhance the capabilities for spatial point pattern analysis contained within S+SpatialStats.

School Safety and Juvenile Applications

Developing Multi-Agency Data Integration for Web-Enabled GIS Crime Mapping: A Safe Schools Example, Vance E. Arnett, Don Lord, and Juan B. Plaza. It is difficult enough to develop integrated databases in which the data is the same type of information from different agencies, but it is even more difficult to integrate diverse data from diverse agencies. As part of the Pinellas Area Crime Mapping and Analysis Network, members of the development team—composed of justice system users, data processing/GIS specialists from the county GIS system, the school system, and the vendor—are working together to create a new application of GIS crime analysis for the county's safe schools program. The full program, which is to go into operation next year, takes a school facility and associated grounds, in combination with the surrounding area, and creates a crime map which pinpoints the exact location and type of incident based upon School Resource Officer reports. The theory behind the project is that schools constitute small communities, and that community policing initiatives will be an effective tool in safe school initiatives.

This presentation documents the procedures and different roles that the partners went through to help bring the diverse systems together and thus create a new analytical tool for safe school applications.

Spatial and Temporal Dynamics of Victimization Before and After Implementation of a Youth Curfew, Caterina Gouvis. This presentation will use GIS to examine the possible effects of a youth curfew on victimization. The analysis will attempt to answer the following questions with regard to the Prince George's County, Maryland, curfew law: (1) Did the overall curfew effects on crime trends differ between high victimization areas and other areas? (2) Was crime-clustering in high victimization areas during curfew and non-curfew hours reduced (i.e., crime diffusion) after the curfew began? (3) Did any high crime areas completely disappear after the curfew was implemented? and (4) Were new problem or high crime areas created after the curfew began (i.e., any evidence of crime displacement)?

Merging Practice, Policy, and Evaluation: The Development of New Survey Technologies in Prevention Needs Assessment, Jack A. Pollard. Risk and protective factors (RPFs), predictive of problem behaviors such as substance abuse and delinquency, are promising targets for preventive intervention. Effective prevention planning requires collection of community-level data on the prevalence of risk and protective factors that provides the information necessary to determine the type of prevention program most likely to be effective in a particular community. However, community-level RPF measurement has been difficult. This presentation reports on the combined application of new school-based survey technologies and geographical information systems (GIS) technologies to measure and display local ATOD use, delinquency, and FPFs.

User/Vendor Focus Group

User/Vendor Focus Group, Christopher S. Gebhardt. This session will present attendees with valuable information about crime mapping from a unique perspective: the vendor. The vendor/agency relationship can be a delicate balance between making a profit and delivering what the agency has asked for. During this session, a moderator will ask the questions

that are on everyone's minds. The panel will consist of three to five vendors from various disciplines in crime mapping including GIS, retail, and/or after-market solutions.

Concurrent Panels, Tuesday, 10:30 a.m. – 12:00 p.m.

Mapping Victimization Data

Tracking Repeat Burglary in Detroit, David E. Martin and Erick E. Barnes. This project, implemented by the Detroit Police Department, seeks to reduce neighborhood burglary rates by preventing repeat burglary victimization. The main components of the project include producing and communicating accurate and timely intelligence about burglary patterns, and implementing rapid deployment of policing and crime prevention strategies in three target neighborhoods. The Detroit Police Department uses ESRI's ArcExplorer software to disseminate computerized crime maps and data to officers and investigators. ArcExplorer is freely available and may be used with other mapping software (such as MapInfo) to make maps and data available over local or wide area networks.

Repeat Victimization: Identifying Vulnerable Areas, Jerry H. Ratcliffe. An understanding of the relationship between repeat victimization distribution and socioeconomic conditions can assist crime prevention agencies in targeting their resources to the most vulnerable areas. Potential problems include the spatial errors that arise when comparing crime locations with polygon data. Inaccurate georeferencing can magnify errors in the analysis by locating the point in the wrong polygon. A technique is demonstrated that uses an areally-weighted approach to minimize errors in the georeferenced crime points. The technique also considers the proximity of, and includes the influence of, nearby polygons. An application provides insight into repeat victimization distribution.

Repeat Victimization for Residential Burglary: A Three-City Study, Deborah Lamm Weisel. The Police Executive Research Forum examined the phenomenon of repeat victimization in three cities—Baltimore, Dallas, and San Diego—for residential burglary using offense data. The research project was developed to shed light on the city-wide incidence of repeat victimization and to examine the relative impact of a police-focused (problem-solving) treatment on the incidence of repeat victimization and its contribution to aggregate offenses in an experimental area. This presentation highlights findings about the incidence, distribution, and concentration of residential burglaries and the relationship between offenses and repeat occurrences, examining differences between and within cities.

Mapping on the Web (Repeated from Monday at 3:30 p.m.)

Developing a Web-based Crime Mapping System, Deena M. Bowman-Jamieson. The San Diego Police Department (SDPD) has provided crime statistics and static maps for public access via the Web for over three years. With the department's commitment to community oriented policing and the rapid change in technology, SDPD in conjunction with the Automated Regional Justice Information System (ARJIS) has developed a regional Internet based mapping application making near real time crime data available to the public. In addition to a project overview, this presentation will address development and evaluation issues.

***Lessons Learned: The Potential for Liability, Misuse, and Misinterpretation of Mapped Crime Data on the Web*, Maria MacGunigal.** In the spring of 1998, the City of Sacramento began a web development project to deliver, among other data, geocoded crimes for several crime categories. When we originally conceived of this project, we had no idea that the City of Sacramento would become one of the first sites in the nation to publish interactive crime mapping on the web. Early on in the development process, we realized the importance of protecting the disclosure of victim information and guarding against the misinterpretation of data by the users. The potential for liability, misuse, and misinterpretation of publishing crime data to the web is of particular concern, due to the ease of access and anonymity that the technology affords the users. It was, however, difficult setting policy guidelines and protecting the city's liability with so few agencies involved in publishing geocoded crime data to the web and very little discussion of the issues.

Predictive Modeling

***Optical Allocation of Police Enforcement Among Adjacent Neighborhoods*, Rajan Batta, Shou-Jiun Wang, and Christopher M. Rump.** In this presentation, we create a quantitative modeling framework to take a geographical area consisting of several neighborhoods into account and develop optimal allocation policies with the assumption that criminals are rational decisionmakers. Criminals who seek to benefit from their criminal behavior decide whether or not to displace their attentions elsewhere based on the characteristics of particular offenses, in particular, their opportunities and profits. This new mathematical model, based on the assumption that the expected monetary return of a crime equals the product of the probability of not being arrested and a successful monetary outcome, is established to modify criminal activities. It can be shown that, as a result, the initial level of crime can determine the steady-state level of crime. The model is then generalized to study optimal enforcement allocation policies. Three objectives are studied: (1) minimizing the total number of crimes in the interested area, (2) minimizing the difference of number of crimes among the neighborhoods, and (3) minimizing the linear combinatory function of them. We start with the scenario of two neighborhoods and generalize the results to the case of multiple neighborhoods.

***Criminal Preference Discovery as the Basis for Event Prediction*, Donald E. Brown.** This presentation will describe a model for predicting the probability of occurrence of criminal events. The model is based upon the discovery of criminal preferences in space and time. Past criminal events serve as the inputs to the process. These events are evaluated based on their locations relative to key spatial features (roads, schools, etc.). We also use census and other demographic data as features for our model. The combination of all of these features gives a high dimensional space in which each feature is a different dimension in the space. Our approach uses mixture modeling techniques to estimate the criminals' preferences within this space. Thus, areas of strong preference are marked by high density of incidents, while areas that are not preferred have lower densities. We then relate this estimate back into the original map of the area. The process is made efficient and effective by careful choice of the features, and we describe a technique to search for the relevant features. We will describe the performance of this approach on breaking and entering data from Richmond, Virginia.

Generation of a Spatial Procedure for the Early Detection of Crime Concentration, Spencer Chainey. As crime pattern analysis has become more sophisticated, there has been increasing interest in the application of spatial forecasting techniques that may help in the prediction of crime. This session will present findings from a research study that investigated the use of a spatial searching algorithm of current recorded events of crime with their historical patterns to help in the early warning of future crime concentrations. We will also explore the inclusion of disorder and anti-social behavior events as preliminary indicators for emerging crime hotspots.

Mapping Around the World II

“Location Advantage”—Application of GIS Technology by the New South Wales Police Service, Tony Mabber. This presentation will discuss the application of data driven management as an appropriate strategy for a major law enforcement agency, using geographic information systems (GIS) as one of the primary tools in the decision support process. Presently, the New South Wales Police Service (NSWPS) has approximately 220 copies of MapInfo running in approximately 140 locations across the state, including all front-line policing locations. GIS team responsibilities will be discussed, including maintenance and distribution of geographic data, and development and delivery of customized training programs. The NSWPS application of GIS technology to a variety of policing activities will also be detailed, including emergency management, planning and response, and using associated technologies such as Global Positioning Systems to support police investigations in remote areas.

Crime Mapping, A Versatile Instrument: German Approach, Peter Nath. Policing in Germany has been strongly emphasized, federally and locally, since the end of WWII, with police forces of the *Länder* (i.e., states) receiving legislative autonomy in many fields of policing. Implemented in the 1970s, the information technology and procedures of information exchange are a mirror of the federal structures that are bonded by a national computer system. The current system is planned to be substituted by a state-of-the-art nationwide system that will incorporate geographical data, thus offering a broad perspective on the use of GIS for nearly every police level.

Theoretical concepts for the maximum exploitation of the newly gained data are promising tremendous changes within the analytical components of the German police. In 1998, a Consultancy Centre for Analysis and service center has been set up within the Federal Criminal Police Office to focus on the activities within the 16 *Länder* police forces and the Federal Border Police. Apart from those concepts, several GIS projects are already under way at various levels of the police, some of which will be presented in the lecture.

Crime Mapping and Expanding Intelligence—Led Policing into Strategies for Community Safety, John Warden. Sergeant Warden will track a specific example of residential break and enters that evolved from a hot spot into a crime wave. The example will show how the clearly identified clusters migrated over time and space and how it was possible to predict with results where the suspects would next be operating. This presentation will demonstrate how crime mapping and analysis, as an integral tool of intelligence-led policing, can have practical and measurable results and will expand into strategies for community safety.

CompStat: Mapping for Accountability

GIS and CODEFOR Strategy, Sally J. Beel. This presentation will consist of a PowerPoint slide show detailing how the Minneapolis Police Department uses MapInfo to assist in identifying emerging crime patterns and disseminating crime information to the department and community. The presentation will show what a typical weekly CODEFOR meeting involves, including the preparation and presentation.

Statewide CompStat Program, Daniel B. Bibel. Based on a standard data collection system, the Massachusetts State Police is developing a system to allow small and medium-sized police departments to analyze and interpret crime data from their own departments, as well as from other agencies in their region. By implementing this system as an Internet application, costs are minimal to each agency. The routine sharing of crime data will have a significant impact on crime fighting in these agencies, which typically do not have the resources to do either crime analysis or mapping.

CompStat and Organizational Change: Preliminary Findings from a National Survey, David Weisburd, Rosann Greenspan, and Steve Mastrofski. Police departments across the country are turning their attention to CompStat as an innovation in police organization that combines state of the art management principles with cutting edge crime analysis and geographic information systems technology. CompStat (“computer statistics”), a management system first developed during William Bratton’s tenure as Commissioner of the New York City Police Department, was implemented as a measure to control crime and improve the quality of the city.

In our presentation, we discuss preliminary findings from a national survey of police agencies conducted by the Police Foundation. The survey provides the first national view of the use of CompStat and CompStat -like programs, and provides a portrait of the nature of such programs as diverse types of police agencies are implementing them. We will place particular emphasis in our presentation on the level of technological development of departments using CompStat and the nature of the integration of crime mapping into CompStat programs.

Privacy: Data Confidentiality vs. Freedom of Information

Sharing Information and Protecting Victim Privacy: You Can Do Both, David R. Anderson. Nearly every police department now uses some form of software to collect information about crime incidents and display that information on detailed maps. Displaying such information on maps allows police and crime analysts to better analyze crime problems and more effectively identify potential solutions.

However, sharing information about criminal incidents can also violate a victim's privacy and increase the risk that they will be re-victimized. While sharing information with other agencies and the public is essential, care should be taken to protect the privacy of crime victims. One way to do this is to ensure that organizations and individuals who are allowed access to private information should be held accountable for how that information is used.

This presentation will address the importance of victim privacy, provide examples of practices that compromise victim privacy, outline the negative effects of privacy violation and suggest methods that protect privacy and allow for effective communication between the police and the community.

Why Government Cannot Ensure Privacy—and Why It Shouldn't Try, Bryan Vila. In *The Transparent Society*, social philosopher David Brin argues that technology will force us to choose between privacy and freedom. Following Brin's lead, this presentation will explain the logical dynamics that make it impossible for government to ensure privacy in a time of rapid technological change. Instead, government should encourage the public's use of technologies such as crime mapping and surveillance equipment in order to build community efficacy and improve the ability of citizens and police to work as partners against crime. This approach also maintains the balance necessary to guarantee freedom by helping the public guard against misuses of government power.